

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 07 March 2001 (07.03.01)	
International application No. PCT/SE00/01423	Applicant's or agent's file reference BS/UB 43732
International filing date (day/month/year) 04 July 2000 (04.07.00)	Priority date (day/month/year) 05 July 1999 (05.07.99)
Applicant SCHWALBE, Pontus	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

01 February 2001 (01.02.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer C. Cupello Telephone No.: (41-22) 338.83.38
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01423

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C02F 3/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI,PAJ,EPODOC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4370234 A (WILLIAM P. MARSLAND), 25 January 1983 (25.01.83), column 5, line 33 - line 48, figure 3, claim 1, abstract	1-5,8,11-13
A	--	6,7,9,10
Y	US 4997562 A (LLOYD S. WARNER), 5 March 1991 (05.03.91), column 1, line 52 - column 2, line 2, figures 1-3, claims 1-5, abstract	1-5,8,11-13
A	--	6,7,9,10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 October 2000

Date of mailing of the international search report

26 -10- 2000

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 00/01423

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3957017 A (GARIBALDI M. CARMIGNANI ET AL), 18 May 1976 (18.05.76), column 3, line 3 - line 64, figure 1, claims 1,6, abstract	1-13
A	DE 396921 B (BETONWERK NAGELER GESELLSCHAFT MBH), 27 December 1993 (27.12.93), page 1, line 20 - line 28, claims 1-3, abstract	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/10/00

International application No.

PCT/SE 00/01423

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	4370234	A	25/01/83	NONE	
US	4997562	A	05/03/91	NONE	
US	3957017	A	18/05/76	AU 8514975 A ES 442339 A IL 48082 D JP 51069098 A	31/03/77 01/08/77 00/00/00 15/06/76
DE	396921	B	27/12/93	NONE	

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



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11 January 2001 (11.01.2001)

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(30) Priority Data:
9902573-6 5 July 1999 (05.07.1999) SE

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

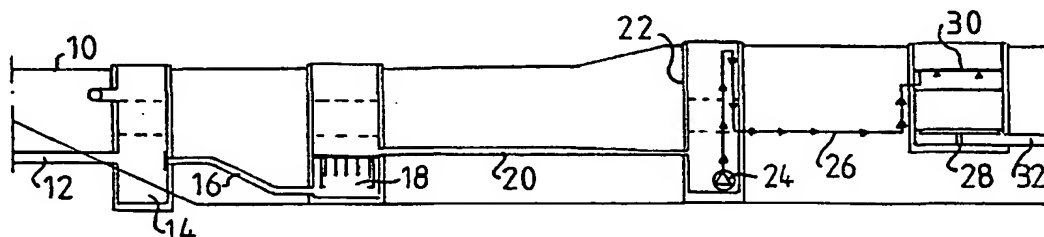
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD AND ARRANGEMENT FOR PURIFICATION OF WATER



(57) Abstract: A method and means for cleaning surface or waste water in which the water is supplied to a sludge separator (14) for the separation of suspendable material. After the sludge separator the water is supplied to a biostep filter in which pollution is deposited at at least one filter body (42, 48) of permeable material of a type on which a bioskin may grow to create microprocesses without the permeability decreases and thereafter further to a sorbent filter (28, 40), whereby the water after this flows to a recipient. A pump (24, 124) is connected to the plant, preferably between the biostep filter (18, 42) and the sorbent filter (28, 40).

WO 01/02310 A1

METHOD AND ARRANGEMENT FOR PURIFICATION OF WATER

The present invention relates to a method for cleaning water, especially surface or waste water from buildings or roads, which water is directed to a sludge separator for separating suspended material. The invention also relates to means for carrying out the method.

Cleaning of sewage water from separate buildings or roads or small groups of houses has up til now been effected by a low degree cleaning with sludge separators, such as three compartment septic tanks. The water flows by gravity to the well in which coarse pollution sediment at the bottom of the wells. 1-2 times a year the well is emptied.

One type of sludge separator or septic tank is known from US-A-4997562. The tank shown in this document is divided into a plurality of chambers in which the water to be cleaned is brought from each chamber to the next by means of a overflow valve so arranged that the chamber is filled with water up to a certain level before the water flow over to the next chamber. This is for preventing sedimented sludge to leave with the water. At the end of the separator a filter chamber is provided in which the water is filtered through sand and a fibrous organic material.

AT-B-396921 describes cleaning means in the form of a three compartment septic tank in which the water passes one chamber for sedimenting sludge, one cleaning chamber and one filter bed. To increase the effect of the cleaning chamber, a plurality of walls are arranged so that the water is urged to flow in a loop through the chamber.

AT-363871 describes cleaning means with three or four chambers, namely, a sludge separator, a filter chamber, an aerating chamber and a final sedimenting chamber. In the filter chamber the water passes from the bottom of the chamber up through a biofilter.

Even if the use of sludge separators is an inexpensive and simple measure, the described cleaning measures, in accordance with higher environmental consciousness, are insufficient since they not fully take care of biological material and/or phosphorus and not at all take care of heavy metals, which therefore come with the water to the recipient.

The main object of the invention is therefore to provide a method and cleaning means, which is simple and inexpensive to install and run, but notwithstanding this, result in a high degree cleaning of the water.

This object is achieved by giving the invention the features stated in the following claims.

The invention will in the following be described in more detail in connection with embodiments, illustrated in the drawings, for the effectuation of the method.

Figure 1 illustrates schematically cleaning means according to the invention.

Figure 2 illustrates another embodiment of cleaning means according to the invention.

Figure 3 illustrates a plan view of the means according to figure 2.

Figure 4 illustrates in a larger scale a section through a biostep filter, which may be used in the plants according to figure 1 and 2.

Figure 5 illustrates in a perspective view an altered embodiment of a sorbent chamber.

Figure 6 illustrates a section through the chamber of figure 5.

Figure 7 illustrates a section like in figure 6 of an altered embodiment.

The plant illustrated in figure 1, may for example be used to take care of surface water at roads and the like. The water flows from an existing road embankment 10 or via a conduit 12 in a known way to a sludge separator, such as a three compartment septic tank 14, in which the most coarse particles sediment from the surface water and stay at the bottom of the well. The sedimented material in the well is emptied at regular intervals, for example 1 to 2 times per year. The water from the sludge separator 14 is directed via a conduit 16 to a biostep filter 18 in which a degradation of biological material occurs, which is described in more detail below in connection with figure 4. The filter 18 has a surface of permeable, sintered pure polyethene on which microorganisms are acting. In the filter 18 the water rises through the filter insert to the level of a conduit 20, which directs the water to a pump station 22 in which a, for example, submersible pump 24 pumps the water to a level from which it, via a conduit 26, flows to a sorbent chamber 28 in which the water, via a manifold pipe 30 with nozzles, is spread and sprinkled over a sorbent material which reduces by an ion exchanger process the content of phosphorus and nitrogen of

the water and where appropriate, also heavy metals. The sorbent material may comprise one or more materials, for example poloniteTM, a calcium silicate which is provided on a perforated bottom. The material is exchanged for example once a year and may after the reception of phosphorus and nitrogen be used as soil improvement agent. From the sorbent chamber flows now the high degree cleaned water via a conduit 32 to a recipient, which could be a lake, moss or the like.

The plant illustrated in the figures 2 and 3 has in principle the same structure as the plant according to figure 1, but has a more compact embodiment for use as a smaller sewage plant, for example for separate houses or groups of houses in sparsely-populated areas. The parts comprised in the plant according to figures 2 and 3 have thus obtained the same reference numerals as the corresponding parts in figure 1 with an additional 1 in front of the numeral. Thus, the waste water from a building or a group of houses is directed via a conduit 110 to a sludge separator 114, which for example is of the three compartment septic tank type. The desludged water is thereafter directed via the conduit 116 to the biostep filter of the plant, which filter comprises a compact house 34 divided into three chambers 36, 38 and 40 which comprises biostep filter, pump and sorbent filter respectively. The biostep filter has in this embodiment only a filter insert 42 provided in the filter chamber 36 and the water flows, after the passage through this insert 42, over to the pump chamber 38 where it is pumped by the pump 124 to the upper portion of the sorbent chamber 40 where it via a nozzle 44 is sprinkled and spread over the underlying sorbent material. The sorbent material may thus be a zeolite material or poloniteTM, as mentioned in connection with the description of figure 1. It is advantageously to stir the material, for example mechanically or by pumping (backflushing) the water through

the material, to prevent clogging of the material and also to improve the cleaning effect. The water may also, instead of be sprayed over the material, be supplied through a conduit at the bottom of the sorbent material and pass upwards through the material to an outlet pipe provided above, which will be described in more detail in connection with figure 7. The cleaned water is directed via the conduit 132 to a recipient.

In figure 4 the bio step filter 18 of figure 1 is illustrated in a larger scale. The water flows into the lower part of the filter chamber 46 from the conduit 16 and rises upwards in the filter chamber by hydrostatical pressure and passes through the cylindrical filters 48. Their cylindrical or pipeshaped filter bodies 48 are of a permeable material, such as sintered pure polyethene, which forms the bottom and walls of the pipe, while the pipe is open upwards. The permeable material is of a type on which, by means of microorganisms, a bio skin may grow to create micro processes without lowering the permeability. The filters 48 lowers in this way BOD-content in waste water and prevent suspended material to reach the following sorbent filter. Thus, at the filters a coating of deposited pollution is formed, which may be flushed clean at regular intervals, for example one to two times a year. The filter bodies 48 are provided, at the top around the opening, with an upper flange 50 with its aid they are sealingly inserted in a plate 52, which in turn, with an inbetween support of a seal 54, rest on a bracket 56 provided around the inner periphery of the chamber 46. The plate 52 is provided with struts 58 with which the insert with the filters 48 may be placed on the ground outside of the well for washing of the filters 48 and which struts 58 are dimensioned in such a way that their weight keeps the plate 52 with the filters 48 pressed against the seal 54 against the pressure of the through flowing water.

For lifting the filter insert out of the well 46, the plate is provided with mountings 60 for a lifting yoke 62, which is provided at the top with a ring 64 for connection to a lifting hook (not shown). The water which comes in through the conduit 16 flows through the permeable mantle surface of the filters 48 while depositing pollution on said surface, as described above, into the inner of the pipeshaped filters and flow out from the opening of the filters 48 above the plate 52 and further to the outlet conduit 20, which leads to the pump station 22.

The sorbent chamber 70 illustrated in figures 5 and 6, which may be inserted instead of the sorbent chamber 28 in figure 1, comprises a concrete bed 72 in which a number of receptacles 74 are provided, which comprises the sorbent material 76 (figure 6), for example of the type previously mentioned in connection with figures 1 and 2. As emerges from figure 6, the sorbent material 76 is filled up in the receptacles 74 to a level "h". Above the receptacles 74 is a water supply system provided comprising a central pipe 78 and to this, above every pair of receptacles 74, connected spray nozzle holder 80 for supporting nozzles or spray nozzles 82, whereby the pipe 78 and the holder 80 rest on beam profile 84. The pipe 78 is at its far end closed by a terminal end 86, while the fore end has connection means 88 for connection with a supply conduit for the water, such as the conduit 26 in figure 1. The sorbent material 76 in each receptacle 74 rest at a bottom 90 of a net or trellis-fabric so that the water after passing the sorbent material 76 may run down into a channel 92 arranged under the bottom 90 and from there via an outlet pipe 94 to a recipient.

At the embodiment illustrated in figure 7 of the sorbent chamber, supply pipes 96 for the water are brought down into

the sorbent material 76 with the height h, which pipes open at the bottom of the material. At the supply pipes 96, agitators 98 is journalled, which stir and keep the sorbent material 76 in movement. This may, as mentioned above, be polonite™, whereby the stirring of the material is done to prevent the forming of lumps and also to improve the cleaning effect. After the water has passed through the sorbent material to its upper portion it is directed away via the conduit 100 to a recipient.

As emerges from the above, a method and means according to the invention are provided for taking care of surface and waste water in an effective and inexpensive way even though a high degree cleaning of the water is obtained so that it without impact on the environment may be released to a natural recipient, such as a lake, river or moss. Further, the sludge separated in the sludge separator 14 may after suitable processing, such as composting, be used as soil improving agent and the sorbent material in the sorbent chamber 28, which is a natural material with high phosphorus binding capacity, may likewise be used as soil improving agent as it also easily emits phosphorus again to the vegetation.

CLAIMS

1. A method for cleaning surface or waste water in which the water is supplied to a sludge separator, biopond or the like for separating of suspendable material, characterised in that the water thereafter is supplied to one or several biostep filters in which the water is made to pass a permeable material of a type at which a permeable bioskin may be made to grow, whereby a deposition of pollution will take place at the filter or filters, whereafter the water is forwarded to the upper or lower portion of a sorbent chamber in which the water is made to flow through a sorbent material in which an ion exchanger process occurs and thereafter is run off to a recipient.

2. The method according to claim 1, characterised in that a biostep filter is used comprising pure sintered polyethene .

3. The method according to claim 1 or 2, characterised in that as sorbent material a natural material with high phosphorus and heavy metal binding capacity, for example zeolite or calcium silicate, such as Polonite [™], is used.

4. The method according to claim 1, 2 or 3, characterised in that the sorbent material is stirred.

5. Means for carrying out the method according to anyone of the claims 1 - 4, for cleaning surface or waste water comprising a sludge separator (14) for coarse separating of suspendable material, characterised in that one or several biostep filter (18, 36) for degradation of biological material is provided after the sludge separator (14, 114) , which bio filter comprises one or several filter of a permeable material and a sorbent filter (28, 40) for reduction of e.g. phosphorus

and/or heavy metals by means of an ion exchanger process provided after the biofilter (18, 36) and a pump station (22, 38) for keeping the flow of the water through the plant and supplying it to the sorbent material is provided in the plant.

6. The means according to claim 5, characterised in that the biostep filter comprises pipe shaped bodies (42, 48) of a permeable material arranged so that the water flows from the outside of the body to its inside while depositing pollution at the external mantle surface of the pipe shaped body (42, 48), where a biological micro-process is created and proceeds without influences on the permeability of the material.

7. The means according to claim 5 or 6, characterised in that the sorbent filter comprises manifold means (30, 44) for distribution of the water over the sorbent material, which is provided at a perforated bottom in the sorbent filter.

8. The means according to anyone of the claims 5 - 7, characterised in that the sorbent filter comprises an agitator (98) for stirring of the sorbent material.

9. The means according to claim 6, characterised in that the pipe-shaped bodies (42, 48) is inserted in a plate (52) and has an opening from the inner of the body which opens up above the plate (52), which is sealingly mounted in a filter chamber (36, 46) in which the water flows into (at 16, 116) the chamber underneath the plate (52) and through the bodies (48) to the upper of the plate (52) and from there further to an outlet (20) from the chamber (46).

10. The means according to claim 9, characterised in that the plate (52) has struts (58) directed downwards, dimensioned so that they force the plate, against the hydrostatic pressure of

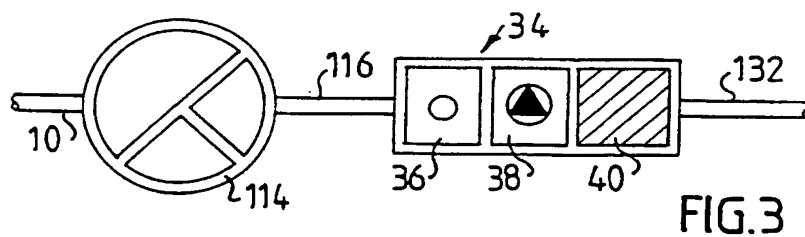
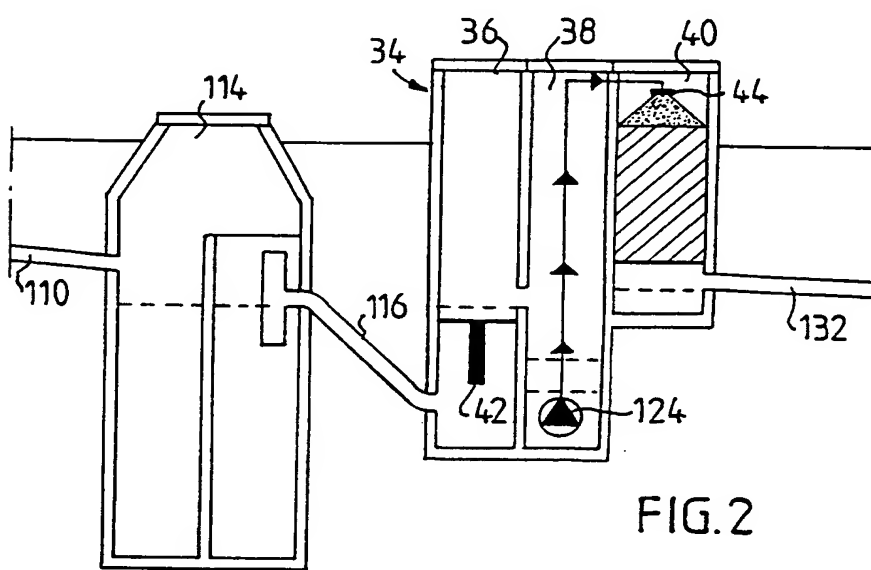
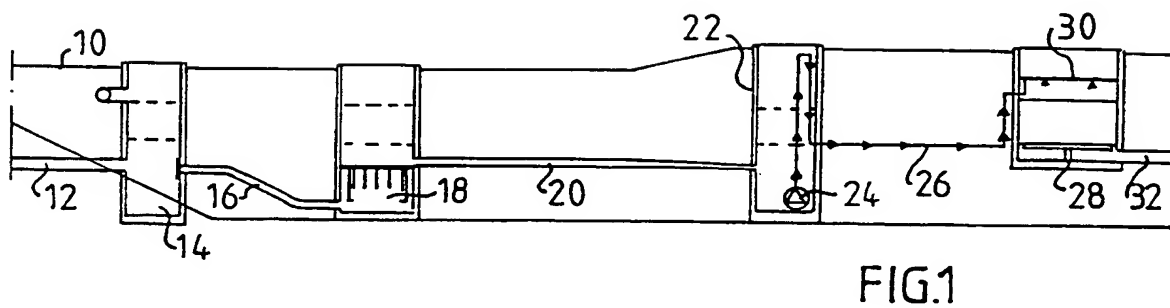
the water, against a support bracket (56) provided at the inner periphery of the filter chamber (46) while a seal (54) supports inbetween.

11. The means according to anyone of the claims 5 to 10, characterised in that the biostep filter (36), the sorbent filter (40) and the pump station (38) are built together in a compact house (34), divided into three corresponding chambers.

12. The means according to the claims 5-11, characterised in that the sorbent filter comprises a chamber (72) in which a number of receptacles (74) with sorbent material are inserted, the water from the previous biostep filter is fed to the receptacles at their upper portion (fig. 6) or bottom (fig. 7).

13. Using of a permeable material at which a bioskin is created, where a biological microprocess proceeds, as material in a biostep filter according to anyone of the claims 5-12.

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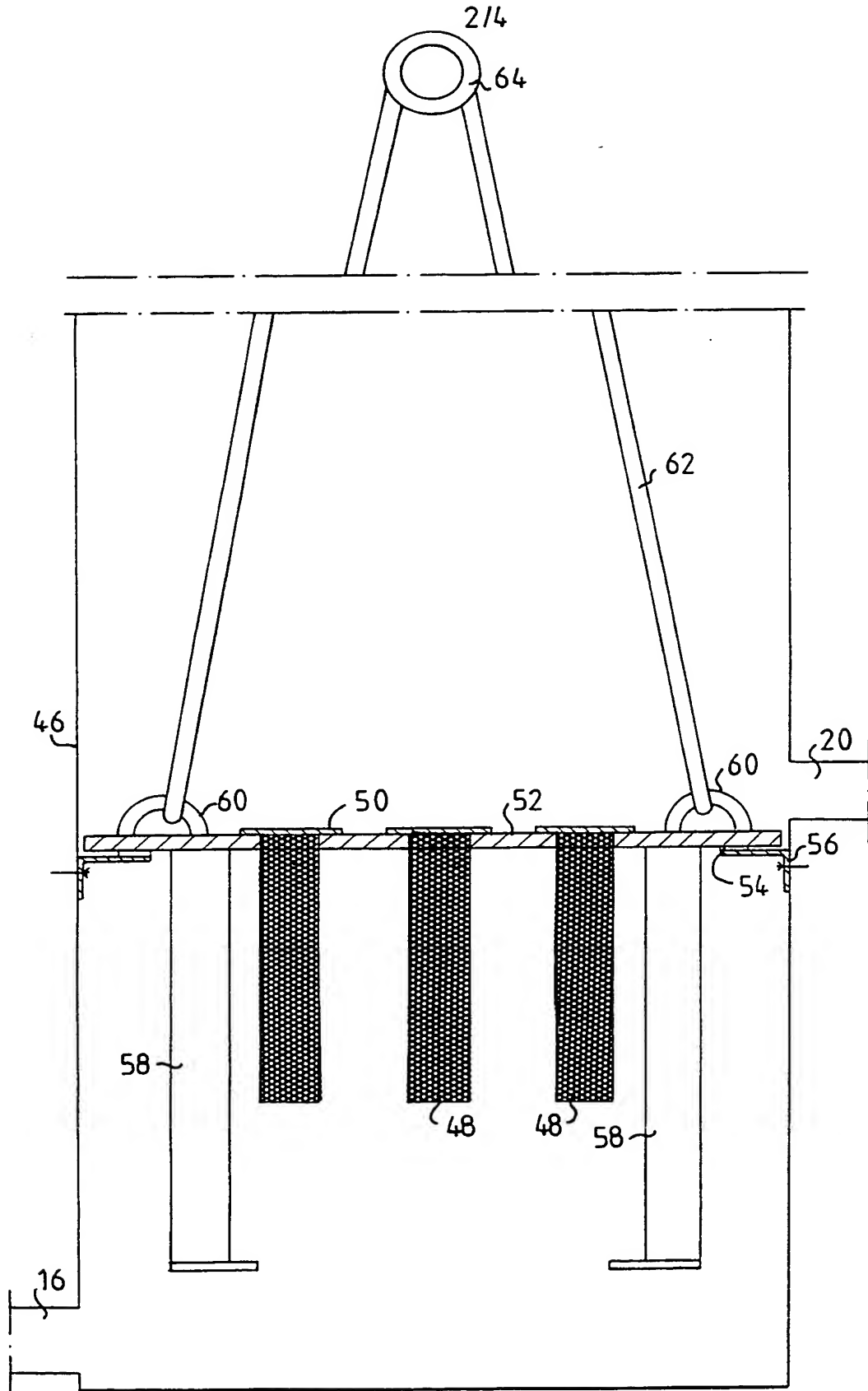


FIG. 4

3/4

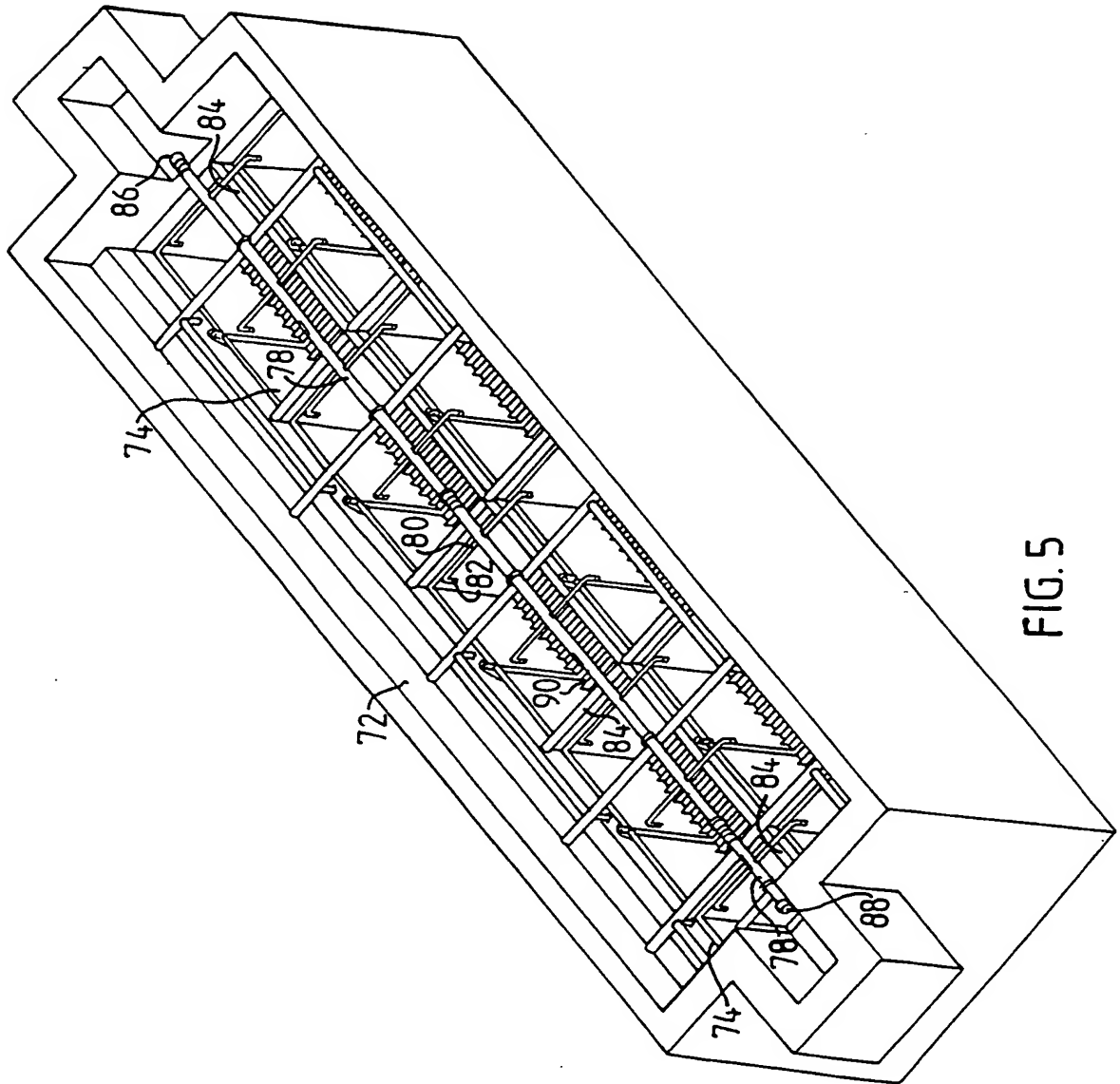


FIG. 5

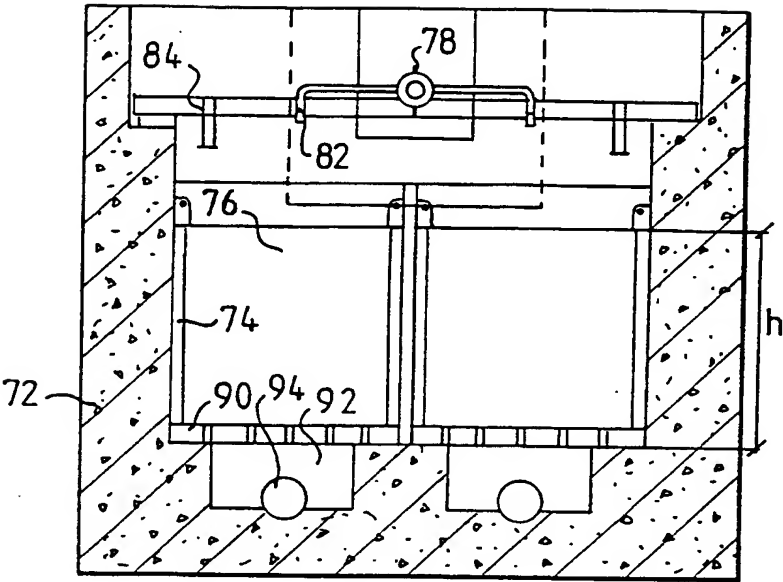


FIG. 6

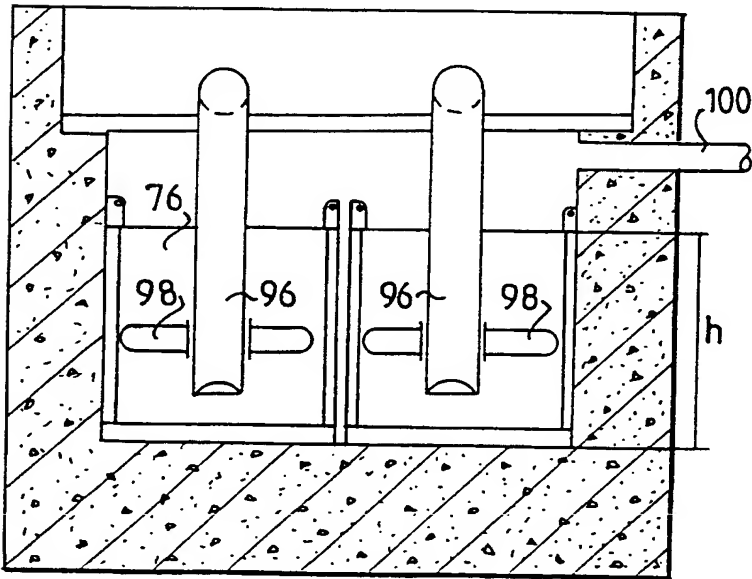


FIG. 7

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

16

Applicant's or agent's file reference BS/UB 43732	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/SE00/01423	International filing date (day/month/year) 04.07.2000	Priority date (day/month/year) 05.07.1999
International Patent Classification (IPC) or national classification and IPC ₇ C 02 F 3/28		
Applicant Globe Water AB et al		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 3 sheets, including this cover sheet.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

- This report contains indications relating to the following items:

- ☒ Basis of the report
- ☐ Priority
- ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Lack of unity of invention
- ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Certain documents cited
- ☐ Certain defects in the international application
- ☐ Certain observations on the international application

Date of submission of the demand 01.02.2001	Date of completion of this report 19.10.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Authorized officer Mattias Arvidsson/ELY Telephone No. 08-782 25 00

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01423

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages 1-7, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☒ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages 1-3, filed with the letter of 17.08.2001
- ☒ the drawings:
pages 1-4, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language English which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☒ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/SE00/01423

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	<u>1-13</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>1-13</u>	YES
	Claims		NO
Industrial applicability (IA)	Claims	<u>1-13</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The invention relates to a method for cleaning water, especially surface or wastewater from buildings or roads, which water is directed to a sludge separator for separating suspended material. The invention also relates to means for carrying out the method.

The following documents cited in the International Search Report are of particular relevance:

D1: US 4370234 A

D2: US 4997562 A

Cited document D1 relates to a system and method for removing ammonia from wastewater.

Cited document D2 relates to a multiple-chambered septic tank with elongated partition crossover conduits.

The documents cited in the International Search Report represent background art.

The invention defined in the amended claims 1-13 is not disclosed by any of these documents.

None of the cited documents gives any indication towards the method for cleaning water, especially surface or wastewater from buildings or roads, which water is directed to a sludge separator for separating suspended material. No relevant combination of the cited documents would lead a person skilled in the art to the invention defined in the amended claims.

Therefore, the invention defined in the amended claims 1-13 is novel and is considered to involve an inventive step. It is also considered to be industrially applicable.

CLAIMS

1. A method for cleaning surface or waste water in which the water is supplied to a sludge separator, biopond or the like for separating of suspendable material, characterised in that the water thereafter is supplied to one or several biostep filters in which the water is made to pass a permeable material of a type at which a permeable bioskin may be made to grow, whereby a deposition of pollution will take place at the filter or filters, whereafter the water is forwarded to the upper or lower portion of a sorbent chamber in which the water is made to flow through a sorbent material in which an ion exchanger process occurs and thereafter is run off to a recipient.
2. The method according to claim 1, characterised in that a biostep filter is used comprising pure sintered polyethylene.
3. The method according to claim 1 or 2, characterised in that as sorbent material a natural material with high phosphorus and heavy metal binding capacity, for example zeolite or calcium silicate, such as Polonite™, is used.
4. The method according to claim 1, 2 or 3, characterised in that the sorbent material is stirred.
5. Means for carrying out the method according to anyone of the claims 1 - 4, for cleaning surface or waste water comprising a sludge separator (14) for coarse separating of suspendable material, characterised in that one or several biostep filter (18, 36) for degradation of biological material is provided after the sludge separator (14, 114), which bio filter comprises one or several filter of a permeable material and a sorbent filter (28, 40) for reduction of e.g. phosphorus

and/or heavy metals by means of an ion exchanger process provided after the biofilter (18, 36) and a pump station (22, 38) for keeping the flow of the water through the plant and supplying it to the sorbent material is provided in the plant.

6. The means according to claim 5, characterised in that the biostep filter comprises pipe shaped bodies (42, 48) of a permeable material arranged so that the water flows from the outside of the body to its inside while depositing pollution at the external mantle surface of the pipe shaped body (42, 48), where a biological micro-process is created and proceeds without influences on the permeability of the material.

7. The means according to claim 5 or 6, characterised in that the sorbent filter comprises manifold means (30, 44) for distribution of the water over the sorbent material, which is provided at a perforated bottom in the sorbent filter.

8. The means according to anyone of the claims 5 - 7, characterised in that the sorbent filter comprises an agitator (98) for stirring of the sorbent material.

9. The means according to claim 6, characterised in that the pipe-shaped bodies (42, 48) is inserted in a plate (52) and has an opening from the inner of the body which opens up above the plate (52), which is sealingly mounted in a filter chamber (36, 46) in which the water flows into (at 16, 116) the chamber underneath the plate (52) and through the bodies (48) to the upper of the plate (52) and from there further to an outlet (20) from the chamber (46).

10. The means according to claim 9, characterised in that the plate (52) has struts (58) directed downwards, dimensioned so that they force the plate, against the hydrostatic pressure of

the water, against a support bracket (56) provided at the inner periphery of the filter chamber (46) while a seal (54) supports inbetween.

11. The means according to anyone of the claims 5 to 10, characterised in that the biostep filter (36), the sorbent filter (40) and the pump station (38) are built together in a compact house (34), divided into three corresponding chambers.

12. The means according to the claims 5-11, characterised in that the sorbent filter comprises a chamber (72) in which a number of receptacles (74) with sorbent material are inserted, the water from the previous biostep filter is fed to the receptacles at their upper portion (fig. 6) or bottom (fig. 7).

13. Using of a permeable material at which a bioskin is created, where a biological microprocess proceeds, as material in a biostep filter according to anyone of the claims 5-12.